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Booklet 2B

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ASSIGNMENT BOOKLET 2B

SCN1270 Science 10
Module 2: Section 2 Assignment

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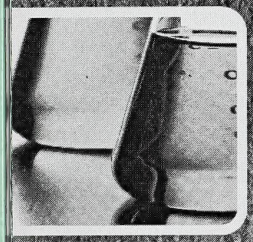
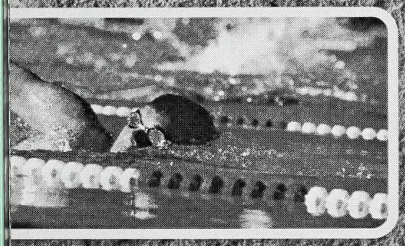
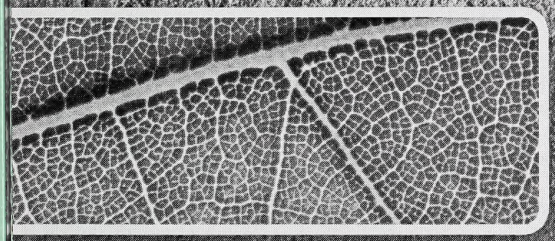
SCIENCE 10

Module 2

Energy Flow in Technological Systems







Assignment Booklet 2B

Learning Technologies Branch

Alberta EDUCATION

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Summary

	Total Possible Marks	Your Mark
Section 2 Assignment	48	

Teacher's Comments

Science 10
Module 2: Energy Flow in Technological Systems
Assignment Booklet 2B
Section 2 Assignment
Learning Technologies Branch
ISBN 0-7741-2699-X

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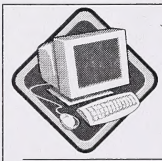
The Learning Technologies Branch acknowledges with appreciation the Alberta Distance Learning Centre and Pembina Hills Regional Division No. 7 for their review of this Assignment Booklet.

This document is intended for	
Students	✓
Teachers	✓
Administrators	
Home Instructors	
General Public	
Other	



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- Alberta Education, **http://www.education.gov.ab.ca**
- Learning Technologies Branch, **http://www.education.gov.ab.ca/ltb**
- Learning Resources Centre, **http://www.lrc.education.gov.ab.ca**

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ASSIGNMENT BOOKLET 2B
SCIENCE 10: MODULE 2
SECTION 2 ASSIGNMENT

This Assignment Booklet is worth 48 marks out of the total 123 marks for the assignments in Module 2. The value of each assignment and each question is stated in the left margin.

Read all parts of your assignment carefully and record your answers in the appropriate places. If you have difficulty with an assignment, go back to your Student Module Booklet and review the appropriate lesson. Be sure to proofread your answers carefully before submitting your Assignment Booklet.

Section 2 Assignment: Energy in Mechanical Systems

(48)

1. Match each type of energy with the description that BEST suits it. Place your answer in the blank space given.

   i. energy due to an object's motion and position
   ii. energy of motion
   iii. energy due to an object's position above Earth's surface
   iv. energy due to fusion of hydrogen nuclei on the Sun
   v. potential energy stored in the chemical bonds of compounds
   vi. potential energy stored in the nuclei of atoms

(½) _____ a. gravitational potential energy

(½) _____ b. kinetic energy

(½) _____ c. nuclear energy

(½) _____ d. solar energy

2. Count Rumford was an early investigator into the nature of thermal energy.

(1) a. What observation led Rumford to conclude that thermal energy (heat) and mechanical energy were related?

_____

(1) _____

b. What evidence contradicted the idea that heat was a fluid?

_____

_____

3. The following forms of energy were illustrated by events that took place in a science laboratory:

   chemical energy, electrical energy, gravitational potential energy, kinetic energy, radiant energy, and visible-light energy

   Identify which form of energy is illustrated by each of the following events. Pick a different form of energy for each event.

(½) a. A massive object is attached to a block of wood by a cord running over a pulley. After being released, the object falls to the surface of a table pulling a block of wood up a ramp.

_____

(½) b. A pendulum is pulled back to one side and released. The pendulum then swings down and then back again. At the bottom of the swing, the pendulum moves at its maximum speed.

_____

(½) c. A radiometer has four vanes suspended inside a glass bulb. The veins of a radiometer start rotating when light is shone on them.

_____

(½) d. After a hard rubber rod is rubbed with a piece of fur, the rod picks up bits of paper.

_____

(½) e. Turning on a flashlight illuminates surfaces in front of the flashlight.

_____

(½) f. When vinegar is dripped onto baking soda, the mixture starts fizzing. Bubbles of gas appear.

_____

Return to page 72 of the Student Module Booklet and begin Section 2: Lesson 2.

For questions 4 and 5, read each question carefully. Decide which of the choices BEST answers the question. Place your answer in the blank space given.

(1) _____ 4. A car on a hilltop, a fresh battery, a stretched elastic band, and a tank of gasoline each have energy. What kind of energy do they **all** have in common?

A. kinetic energy
B. potential energy
C. elastic potential energy
D. chemical potential energy

(1) _____ 5. Pemican is a concentrated food traditionally used by First Nations peoples. What specific kind of potential energy does pemican have that makes it a source of dietary calories?

A. kinetic energy
B. elastic potential energy
C. chemical potential energy
D. gravitational potential energy

(1) 6. A championship weight lifter did 1.10×10^4 J of work on a set of barbells weighing 3680 N. How much gravitational potential energy did the barbells have at the maximum height of the lift? **Show your work.**

(1) 7. Nancy weighed her empty backpack with a spring scale. She found that the pack weighed 8.1 N. Suppose she picks up her backpack from a desktop and lifts it through a height of 42 cm. How much gravitational potential energy does the backpack gain? **Show your work.**

(2) 8. A box having a mass of 5.00 kg is lifted 75.0 cm from ground level to the top of a desk. What is the gravitational potential energy of the box on the desktop? **Show your work.**

(2) 9. A diver is standing on the diving board. The diver has a mass of 85.0 kg and has a gravitational potential energy of 2.50×10^3 J standing on the diving board. Determine how high the diver is above the water surface. (Assume the water is at ground level.) **Show your work.**

Return to page 82 of the Student Module Booklet and begin Section 2: Lesson 3.

For questions 10 to 13, read each question carefully. Decide which of the choices BEST completes the statement or answers the question. Place your answer in the blank space given.

(1) _____ 10. A moving body has energy due to its motion. This energy is called

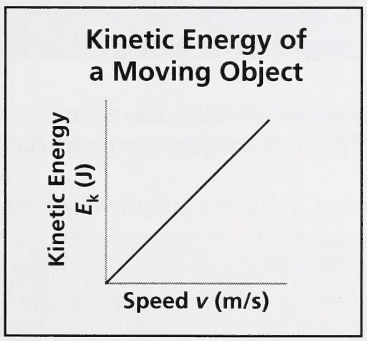
A. kinetic energy
B. dynamic energy
C. physical energy
D. potential energy

(1) _____ 11. In the formula $E_k = \frac{1}{2}mv^2$, the left side of the equation is in joules. Based on the expression on the right side of the equation, $\frac{1}{2}mv^2$, which of the following correctly shows the joule derived from the fundamental units kg, m, and s?

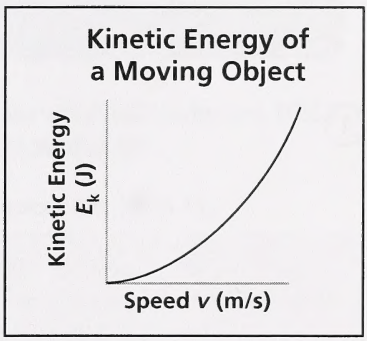
A. m^2/s^2
B. kg•m/s
C. $kg^2 \cdot m/s^2$
D. $kg \cdot m^2/s^2$

(1) _____ 12. The relationship between the kinetic energy of a moving object and its speed can be represented by a graph. Which graph correctly shows this relationship?

A.



B.



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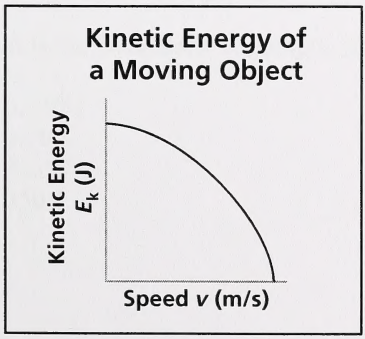

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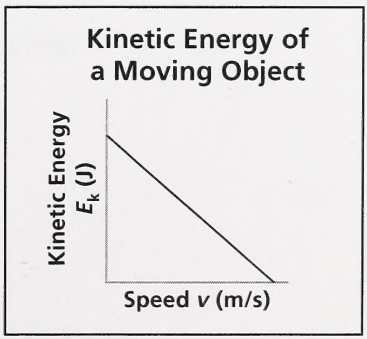
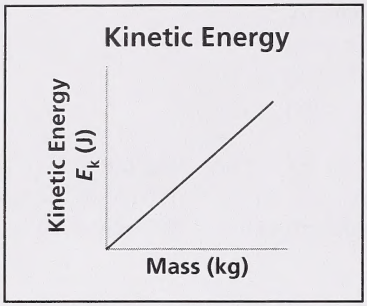


(1) _____ 13. Suppose some objects of different mass travel at the same constant speed. The relationship between their kinetic energy and their mass can be represented by a graph. Which of the following graphs correctly shows the relationship between kinetic energy and mass?

A.



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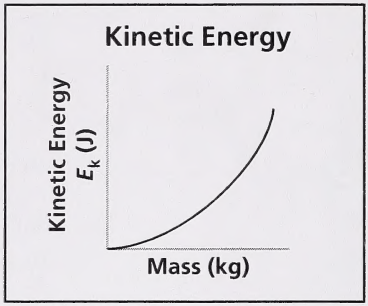
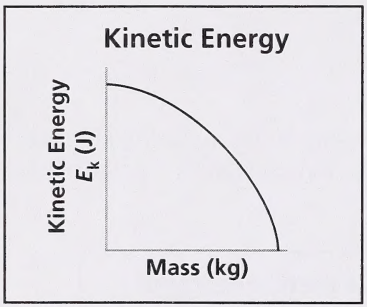


C.



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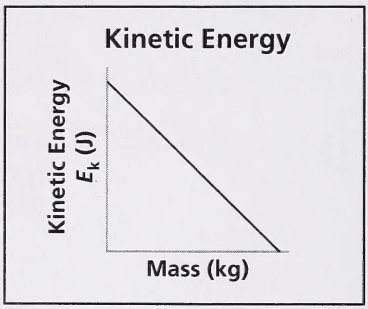


(1) 14. A vehicle has a mass of 1990 kg. It is travelling at a speed of 28.0 m/s. Determine the kinetic energy of the vehicle. **Show your work.**

(2) 15. A pitcher throws a baseball towards home plate. The baseball, which has a mass of 145 g, approaches the plate with 122 J of kinetic energy. Calculate the speed of the baseball. **Show your work.**

Return to page 89 of the Student Module Booklet and begin Section 2: Lesson 4.

For questions 16 to 19, read each question carefully. Decide which of the choices BEST answers the question. Place your answer in the blank space given.

Use the following information to answer questions 16 to 19.

A spring is used to launch a ball with a mass of 1.00×10^{-2} kg. The spring is compressed 10.0 cm using an average force of 35.0 N. For a launch, the ball is placed against the movable end of the spring and the compressed spring is released.

(1) _____ 16. What is the work done in compressing the spring?

A. 0.350 J
B. 3.50 J
C. 35.0 J
D. 350 J

(1) _____ 17. Suppose the spring launches the ball sideways along a track. When the spring is released, what is the kinetic energy of the ball the moment it leaves the end of the spring?

A. 1.23 J
B. 1.75 J
C. 2.49 J
D. 3.50 J

(1) _____ 18. What is the speed of the ball the moment it leaves the end of the spring?

A. 13.3 m/s
B. 26.5 m/s
C. 85.7 m/s
D. 700 m/s

(1) _____ 19. Suppose the ball is launched straight up into the air. How high will the ball go?

A. 0.100 m
B. 10.1 m
C. 17.8 m
D. 35.7 m

20. A 0.450-kg baseball comes off a bat and goes straight up. At a height of 10.0 m, the baseball has a speed of 24.5 m/s.

(2) a. Determine its mechanical energy at this height. **Show your work.**

(1) b. What is the baseball's mechanical energy when it is at a height of 9.0 m? Explain your answer.

_____

_____

_____

(2) 21. A pendulum is made of a 250-g metal ball suspended 50.0 cm below a support by a string. The ball is moved sideways along the swing arc so that it is 4.0 cm higher than it is at the bottom of its swing. The ball is then released. Calculate the speed of the ball at the bottom of the swing. **Show your work.**

(3) 22. A person hits a 45-g golf ball. The ball comes down on a tree root and bounces straight up with an initial speed of 14.0 m/s. Determine the height the ball will rise after the bounce. **Show your work.**

Return to page 102 of the Student Module Booklet and begin Section 2: Lesson 5.

For questions 23 and 24, read each question carefully. Decide which of the choices BEST answers the question. Place your answer in the blank space given.

(1) _____ 23. Which flowchart BEST represents the energy conversions in a coal-burning power station?

A. chemical energy → thermal energy → kinetic energy → electrical energy
B. chemical energy → kinetic energy → thermal energy → electrical energy
C. thermal energy → chemical energy → kinetic energy → electrical energy
D. kinetic energy → chemical energy → thermal energy → electrical energy

(1) _____ 24. Of the energy conversions that occur in a coal-burning power station, which conversion produces the greatest amount of waste thermal energy?

A. kinetic energy → electrical energy
B. thermal energy → chemical energy
C. chemical energy → thermal energy
D. thermal energy → kinetic energy

25. Match each description with one of the following terms.

i. combustion ii. photosynthesis iii. respiration

(1) _____ a. a reaction in which light energy, carbon dioxide, and water yield carbohydrates and oxygen

(1) _____ b. a reaction in which flammable hydrocarbons combine with oxygen to yield thermal energy, carbon dioxide, and water

(1) _____ c. a reaction in which carbohydrates and oxygen yield energy, carbon dioxide, and water

(2) 26. List four general types of changes that can result from an energy conversion.

_____

_____

(2) 27. Why is it that not all the light that strikes the leaves of a plant is stored as chemical energy?

_____

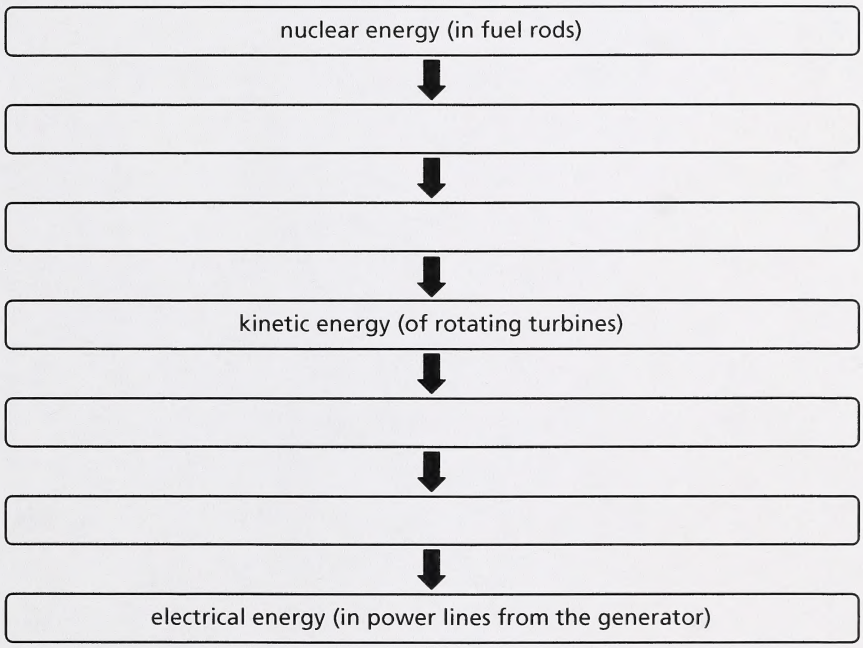
_____

(4)

28. In a nuclear power plant, there are several energy conversions. Use the following list to complete the flowchart of the energy conversions in a nuclear power plant.

- electrical energy (in wire of generator coil)
- kinetic and elastic potential energy (of steam under pressure and in motion)
- kinetic energy (of rotating coil in a generator)
- thermal energy (due to nuclear fission)

Energy Conversions in a Nuclear Power Plant



(1)

29. How are solar cells and batteries similar in function?

_____

_____

Submit your completed Assignment Booklet 2B to your teacher for assessment. Then return to page 110 of the Student Module Booklet and begin Section 3.

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